

C1 Exercise 2B (solve quadratics by factorisation)

1 Solve $x^2 = 4x$

$$\Rightarrow x^2 - 4x = 0$$

move it all to LHS

$$\Rightarrow x(x - 4) = 0$$

what fits into all the terms on LHS
bring it out of a bracket

$$\Rightarrow \text{either } x = 0 \text{ or } (x - 4) = 0$$

$$\text{so } x = 0 \text{ or } x = 4 \text{ are solutions}$$

2 Solve $x^2 = 25x$

$$\Rightarrow x^2 - 25x = 0$$

$$\Rightarrow x(x - 25) = 0$$

$$\Rightarrow \text{either } x = 0 \quad \text{or} \quad x - 25 = 0$$

so $x = 0$ and $x = 25$ are solutions

3

Solve

$$3x^2 = 6x$$

$$\Rightarrow x^2 = 2x$$

$$\Rightarrow x^2 - 2x = 0$$

$$\Rightarrow x(x-2) = 0$$

$$\Rightarrow \text{either } x=0 \text{ or } x-2=0$$

so $x=0$ and $x=2$ are solutions

↖ divide both sides by 3.*

* You can divide both sides by any common factor EXCEPT x .
Why can't you divide by x ?

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4

Solve

$$5x^2 = 30x$$

$$\Rightarrow x^2 = 6x$$

$$\Rightarrow x^2 - 6x = 0$$

$$\Rightarrow x(x - 6) = 0$$

$$\Rightarrow \text{either } x = 0 \text{ or } x - 6 = 0$$

So $x = 0$ and $x = 6$ are solutions

C1 Ex 2B

5

Solve

$$x^2$$

$$x^2 + x = 0$$

$$\Rightarrow (x+1)(x+2) = 0$$

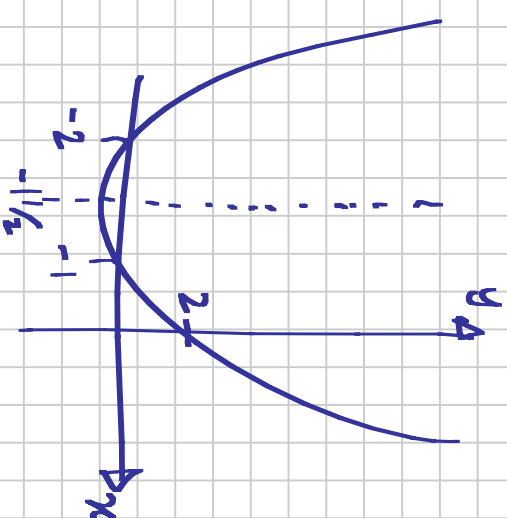
factorise if possible.

$$\Rightarrow \text{either } (x+1) = 0 \text{ or } (x+2) = 0$$

so $x = -1$ and $x = -2$ are solutions

$$(x^2 + x + 2)$$

	$x+1$
x	x^2
$+2$	x
	2



C1 Ex 2B

6 Solve $x^2 + 5x + 4 = 0$

$$\Rightarrow (x+1)(x+4) = 0$$

$$\Rightarrow \text{either } x+1=0 \quad \text{or} \quad x+4=0$$

$$\text{so } x = -1 \quad \text{and} \quad x = -4 \text{ are solutions}$$

C1 Ex 2B

7 Solve $x^2 + 7x + 10 = 0$

$$\Rightarrow (x + 2)(x + 5) = 0 \quad *$$

$$\Rightarrow \text{either } x + 2 = 0 \text{ or } x + 5 = 0$$

$$\text{so } x = -2 \text{ or } x = -5.$$

* Check for yourself that if you expand $(x+2)(x+5)$ you do indeed get $x^2 + 7x + 10$.

CI Ex 2B

8

Solve

$$x^2 + x = 0$$

$$\Rightarrow (x+2)(x-3) = 0$$

$$\Rightarrow \text{either } x+2=0 \quad \text{or } x-3=0$$

So $x=-2$ and $x=3$ are solutions

C1 Ex 2B

9 Solve $x^2 - 8x + 15 = 0$

$$\Rightarrow (x-3)(x-5) = 0$$

$$\Rightarrow x-3=0 \quad \text{or} \quad x-5=0$$

$$\Rightarrow x=3 \quad \text{or} \quad x=5 \quad \text{are solutions}$$

C1 Ex 2B

10 Solve

$$x^2 - 9x + 20 = 0$$

$$\Rightarrow (x-4)(x-5) = 0$$

$$\Rightarrow x-4 = 0 \quad \text{or} \quad x-5 = 0$$

$$\Rightarrow \text{solutions } x=4 \quad \text{or} \quad x=5$$

C1 Ex 2B

11

Solve $x^2 - 5x - 6 = 0$

$$\Rightarrow (x - 6)(x + 1) = 0$$

$$\Rightarrow x = 6 \quad \text{or} \quad x = -1$$

C1 Ex 2B

12 Solve

$$x^2 - 4x - 12 = 0$$

$$\Rightarrow (x - 6)(x + 2) = 0$$

$$\Rightarrow x = 6 \quad \text{or} \quad x = -2$$

CI Ex 2B

13

Solve

$$2x^2 + 7x + 3 = 0$$

$$\Rightarrow (2x + 1)(x + 3) = 0$$

$$\Rightarrow \text{either } 2x + 1 = 0 \quad \text{or } x + 3 = 0$$

$$\text{so } 2x = -1 \quad \text{or } x = -3$$

$$\text{so } x = -\frac{1}{2} \quad \text{or } x = -3 \quad \text{are solutions}$$

Alternate method

13

Solve

$$2x^2 + 7x + 3 = 0$$

$a \qquad b \qquad c$

find p & q , so that $pq = ac$ and $p+q = b$

$$ac = 6 \quad p = 6 \quad q = 1$$

write $ax^2 + px + qx + c = 0$

$$2x^2 + 6x + x + 3 = 0$$

$$2x(x+3) + 1(x+3) = 0$$

$$(2x+1)(x+3) = 0$$

C1 Ex 2B

14 Solve $6x^2 - 7x - 3 = 0$

$$\Rightarrow (3x+1)(2x-3) = 0 \quad *$$

$$\Rightarrow x = -\frac{1}{3} \quad \text{or} \quad x = \frac{3}{2} \quad \left(\text{which is the same as } x = 1\frac{1}{2} \text{ and } x = 1.5 \right)$$

* You might wish to check:

$$\begin{aligned} (3x+1) \overset{6x^2}{\overset{-3}{\times}} (2x-3) &= 6x^2 + 2x - 9x - 3 \\ &= 6x^2 - 7x - 3 \end{aligned}$$

C1 Ex 2B

15

Solve

$$6x^2 - 5x - 6 = 0$$

$$\Rightarrow (3x + 2)(2x - 3) = 0$$

$$\Rightarrow x = -2/3 \quad \vee \quad x = 3/2 = 1\frac{1}{2} = 1.5$$

C1 Ex 2B

16

$$4x^2 - 16x + 15 = 0$$

$$4 \times 15 = 60$$

$$-6x - 10 = 60 \text{ and } -6 + -10 = -16$$

$$4x^2 - 6x - 10x + 15 = 0$$

$$(2x - 3)(2x) + (2x - 3)(-5) = 0$$

$$(2x - 3)(2x - 5) = 0$$

$$x = \frac{3}{2} \text{ or } x = \frac{5}{2}$$

C1 Ex 2B

17 $3x^2 + 5x = 2$

$$3x^2 + 5x - 2 = 0$$

$$3x - 2 = -6$$

$$6x - 1 = -6 \quad \text{and} \quad 6x + 1 = 5$$

$$3x^2 + 6x - x - 2 = 0$$

$$(3x)(x+2) + (-1)(x+2) = 0$$

$$(3x-1)(x+2) = 0$$

$$x = \frac{1}{3}, \quad x = -2$$

C1 Ex 2B

18

$$(2x-3)^2 = 9$$

'mechanical' approach

$$4x^2 - 6x - 6x + 9 = 9$$

$$4x^2 - 12x = 0$$

$$4x(x-3) = 0$$

$$x = 0 \text{ or } x = 3$$

smart approach - see example 6 on p18.

$$(2x-3)^2 = 9$$

$$2x-3 = \pm 3$$

$$2x = 6 \text{ or } 2x = 0$$

$$x = 3 \text{ or } x = 0$$

C1 Ex 2B

19

$$(x-7)^2 = 36$$

$$x-7 = \pm 6$$

$$x = 7 \pm 6$$

$$x = 13 \quad \text{or} \quad x = 1$$

C1 Ex 2B

$$20 \quad 2x^2 = 8$$

$$x^2 = 4$$

$$x = \pm 2$$

$$x = 2 \quad \text{or} \quad x = -2$$

C1 Ex 28

21

$$3x^2 = 5$$

$$x^2 = \frac{5}{3}$$

$$x = \pm \sqrt{\frac{5}{3}}$$

$$x = \pm \sqrt{\frac{5}{3}} \times \frac{\sqrt{3}}{\sqrt{3}} \quad \text{or} \quad x = \frac{-\sqrt{5}}{\sqrt{3}}$$

$$x = \pm \frac{\sqrt{15}}{3}$$

$$\text{or} \quad x = -\frac{\sqrt{15}}{3}$$

use the simplifying surds techniques you learnt in C1 Exercise 14.

C1 Ex 2B

22

$$(x-3)^2 = 13$$

$$x-3 = \pm\sqrt{13}$$

$$x = 3 \pm \sqrt{13}$$

$$x = 3 + \sqrt{13}$$

or

$$x = 3 - \sqrt{13}$$

C1 Ex 2B

23

$$(3x-1)^2 = 11$$

$$3x-1 = \pm\sqrt{11}$$

$$3x = 1 \pm \sqrt{11}$$

$$x = \frac{1 \pm \sqrt{11}}{3}$$

$$\text{So } x = \frac{1 + \sqrt{11}}{3}$$

$$\text{or } x = \frac{1 - \sqrt{11}}{3}$$

C1 Ex 2B

24

$$5x^2 - 10x^2 = -7 + x + x^2$$

should this be $-10x$?

suppose not...

$$-5x^2 = -7 + x + x^2$$

$$0 = 6x^2 + x - 7$$

$$0 = (6x + 7)(x - 1)$$

$$\Rightarrow x = -\frac{7}{6} \text{ or } x = 1$$

suppose so...

$$5x^2 - 10x = -7 + x + x^2$$

$$4x^2 - 11x + 7 = 0$$

$$(4x - 7)(x - 1) = 0$$

$$\Rightarrow x = \frac{7}{4} \text{ or } x = 1$$

CI Ex 2B

25 Solve

$$6x^2 - 7 = 11x$$

$$6x^2 - 11x - 7 = 0$$

$$6x - 7 = -42 \Rightarrow -14, 3$$

$$6x^2 + 3x - 14x - 7 = 0$$

$$3x(2x + 1) - 7(2x + 1) = 0$$

$$(3x - 7)(2x + 1) = 0$$

$$\Rightarrow x = 7/3 \quad \text{or} \quad x = -1/2.$$

C1 Ex 2B

$$26 \quad 4x^2 + 17x = 6x - 2x^2$$

$$6x^2 + 11x = 0$$

$$x(6x + 11) = 0$$

$$x = 0 \quad \text{or} \quad x = -\frac{11}{6}$$